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始鼠化石在甘肃省党河地区上渐新统的发现[1)]

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关键词 甘肃党河地区,晚渐新世,始鼠科
中图法分类号 Q915.873

始鼠科(Eomyidae)是一类已绝灭的小型的鼠类,在古近纪和新近纪时广布全北区,以北美(中始新世—晚中新世)和欧洲(早渐新世—晚上新世)发现的化石较丰富。过去在亚洲发现的始鼠化石极少。亚洲的第一个始鼠化石是1982年才发现的(郑绍华等,1982)。20世纪90年代以来,在亚洲陆续发现了一些始鼠化石,表明从中始新世到上新世时在亚洲已有始鼠生存过(Wang and Emry,1990;Qiu,1994,1996;Tomida and Setoguchi,1994;Emry et al.,1997;王伴月等,1999)。但发现化石的地点不多,而且化石的数量和种类都很有限。在甘肃省党河地区采集到的始鼠化石,是该科化石在这一地区的首次发现,也是亚洲晚渐新世始鼠化石的第二个地点。化石虽不多,但为研究亚洲始鼠的性质及其与欧洲和北美大陆的有关种类的关系提供了有意义的信息。

始鼠科 Eomyidae Depéret et Douxami,1902

始齿鼠属 *Eomyodon* Engesser,1987

党河始齿鼠(新种) *Eomyodon dangheensis* sp. nov.

(图1～2;图3,A,C)

正型标本 左m1或m2(IVPP V 13103.1)。

归入标本 2枚p4(IVPP V 13103.2～3),1枚M1/2(V 13103.4)和1枚M3(V 13103.5)。

地点和层位 甘肃省阿克塞哈萨克族自治县民主乡燕丹图村燕丹图沟IVPP Loc. DH 199904;上渐新统。

特征 中等大小的*Eomyodon*;颊齿低冠,具明显的齿尖,齿的纵脊常中断;下颊齿具后颊沟;p4具下原附尖,无下前边尖或脊;m1/2下前边脊游离,下中脊长,舌侧沟均开放,舌侧沟IV较长,下颊侧沟较短;M1/2具前尖后刺,中脊长而直,内脊位于近纵中轴处,颊侧沟II较长,被封闭,舌侧沟较长。

名称来源 Danghe,党河流域为化石产出地区。

比较和讨论 党河的始鼠的颊齿为低冠齿,具明显齿尖,臼齿纵脊常中断,p4和m1/2的下次脊与次尖或其后部连,下舌侧沟IV较短,m1/2的下后脊向后斜,M1/2颊侧沟I较

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短。这些特点与 *Eomyodon* 的是一致的。它们代表 *Eomyodon* 属的一新种,被称为 *E. dangheensis*。它与 *Eomyodon* 属的已知种[*E. volkeri* Engesser, 1987; *E. pusillus* (Falbusch, 1969); *E. mayoi* Engesser, 1990; *E. weidmanni* Engesser, 1990; *E. staudachensis* Engesser, 1990 和 *E. asiaticus* (Wang and Emry, 1990)]的区别在于它的 p4 具明显的下原附尖。它的颊齿的尺寸比 *E. volkeri* 和 *E. mayoi* 的大,而比 *E. weidmanni*、*E. staudachensis* 和 *E. asiaticus* 的小。此外,它与 *E. volkeri* 的区别还在于下颊齿的舌侧沟Ⅱ、Ⅳ和下次脊较长;与 *E. pusillus* 的不同在于下颊齿的下中脊、下次脊和舌侧沟Ⅳ均较长,具下后颊侧沟和 p4 缺下前边尖;不同于 *E. mayoi* 的特点是颊齿较显丘形,具下后外沟,m1/2 的下前边脊孤立,下后脊较少后斜,下次脊较长,较后斜,舌侧沟Ⅱ和Ⅲ舌端开口,舌侧沟Ⅳ较发育和 p4 无下前边脊;与 *E. weidmanni* 的区别是颊齿较显丘形,齿冠较低,p4 相对较小,无下前边脊,m1/2 的下前边脊孤立,舌侧沟Ⅳ较长,M1/2 的颊侧沟Ⅰ较短,颊侧沟Ⅱ较长等。它区别于 *E. staudachensis* 的特点是颊齿齿冠较低,较显丘形,下外脊的位置较靠颊侧,下次脊及舌侧沟Ⅲ和Ⅳ较长,而颊侧沟较短,具下后颊侧沟,m1/2 的下前边脊游离,以及 p4 缺下前边脊;不同于 *E. asiaticus* 的特点还有颊齿齿冠较低,M1/2 具前尖后刺,有较长而直的中脊和较长的舌侧沟,下颊齿有明显的下后颊侧沟,m1/2 下前边脊游离和舌侧沟Ⅱ舌端开口等。

Eomyodon dangheensis 在进化程度上与 *E. volkeri* 相当,而比 *E. asiaticus* 稍原始,比早中新世的 *E. staudachensis* 更原始。据此推测,其产出的时代应为晚渐新世。

笔者重新观察了 Wang 和 Emry(1990)描述的内蒙古晚渐新世的 *Pseudotheridomys asiaticus* 的标本,发现除 V 9575 以外的所有颊齿的基本特点都与 *Eomyodon* 的一致,而与 *Pseudotheridomys* 的不同,建议将 *asiaticus* 种由 *Pseudotheridomys* 属改归为 *Eomyodon* 属,即为 *Eomyodon asiaticus*。该种的 p4(V 9573)原被描述为无下中脊(Wang and Emry, 1990, p. 373),实际上它有长的下中脊,只是因磨蚀较深,变得很低了,不易辨认。V 9575 暂定为 *Pseudotheridomys* sp.。

Eomyodon 在亚洲以前只已知一枚磨蚀较深的 m1/2,被鉴定为 *Eomyodon* sp. (Wang and Emry, 1990)。如果上述二个种归入 *Eomyodon* 属是合理的话,这就不但肯定了 *Eomyodon* 属在渐新世时已在亚洲生存过,而且已发生了分异。到目前为止在北美还没有发现 *Eomyodon* 的报道。这表明 *Eomyodon* 在晚渐新世时仅分布于欧亚大陆,而未到达北美大陆。

DISCOVERY OF LATE OLIGOCENE *EOMYODON* (RODENTIA, MAMMALIA) FROM THE DANGHE AREA, GANSU, CHINA

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Abstract A new species of *Eomyodon*, *E. dangheensis*, is described based on specimens discovered from the late Oligocene in the Danghe area, Gansu, China. Its main features are: cheek teeth brachydont; lower cheek teeth with posterosinusid; p4 with distinct protostylid and without anteroconid or anterolophid; m1/2 with free anterolophid, long mesolophid, lingually open synclinids, well-developed synclinid IV; M1/2 with posterior crest of paracone, long and straight mesoloph, long and closed syncline II, and long sinus.

Pseudotheridomys asiaticus Wang and Emry, 1990, is transferred to *Eomyodon* (*E. asiaticus*) because its cheek teeth, except V 9575, are more similar to *Eomyodon* rather than to *Pseudotheridomys*. V 9575 is tentatively retained as *Pseudotheridomys* sp.

It is evident that *Eomyodon* known in Europe occurred and diversified in Asia in late Oligocene, but has not ever been reported from North America. Thus, the exchange of *Eomyodon* took only place between Asia and Europe in late Oligocene.

Key words Danghe area in Gansu, late Oligocene, Eomyidae

The Danghe River runs northwards from the Danghe Nanshan Mountains at the western end of the famous Qilian Shan Mountains. Cenozoic deposits are widely distributed in the Danghe River valley. In 1931 ~ 1932 Bohlin made an extensive survey in the area and found rich mammalian fossils in the Oligocene and Miocene strata, including over 30 species of 21 genera belonging to 17 families of 7 orders (Bohlin, 1937, 1942, 1946). Since then, the Danghe area has become one of the classic localities of late Oligocene in Asia. One of the Asian Mammal Ages, Tabenbulukian, is based on the late Oligocene Taben-buluk fauna of the Danghe area (Li and Ting, 1983). In 1999 and 2001, along with considerable progress in field geology and stratigraphy, the joint Paleontological Expedition Team of the IVPP, the Institute of Cultural Relics and Archaeology, Gansu, and the Gansu Provincial Museum found also important mammalian fossils, including some new taxa. In this paper I deal with the eomyid fossils, which were first collected in this area. Other taxa will be reported later.

The family Eomyidae is one of the extinct small-sized groups of the rodents. It is widely distributed in the Holarctic Region in Tertiary. Large number of eomyid fossils were found in North America (middle Eocene-late Miocene) and Europe (early Oligocene-late Pliocene). However, few had been reported from Asia. Since the 1990s, eomyids have been reported from middle Eocene to Pliocene in Asia (Wang and Emry, 1990; Qiu, 1994, 1996; Tomida and Setoguchi, 1994; Emry et al., 1997; Wang and Ouyang, 1999). Nevertheless, the localities yielding the eomyids and the taxa of the eomyids are very limited in Asia and the relationships of the Asian eomyids with those of the other continents remain obscure. The discovery of the eomyids from the late Oligocene in the Danghe area, the second locality bearing late Oligocene eomyid in Asia, will provide more information on the Asian eomyids and their relationships with those of other continents.

The terminology used in this paper follows Wang and Emry (1990). The length of syncline(id) and sinus(id) indicate their transverse distance. Abbreviations used here are: DH, Danghe; IVPP, Institute of Vertebrate Paleontology and Paleoanthropology, Chinese Academy of Sciences; IVPP Loc., field locality of IVPP; IVPP V, catalogue number of vertebrate fossils of IVPP.

Eomyidae Depéret et Douxami, 1902

Eomyodon Engesser, 1987

Eomyodon dangheensis sp. nov.

(Figs. 1 ~ 2; Fig. 3, A, C)

Holotype Left m1 or m2 (IVPP V 13103.1).

Referred specimens 2 p4 (IVPP V 13103.2 ~ 3), 1 M1/2 (V 13103.4) and 1 M3 (V 13103.5).

Locality and horizon IVPP Loc. DH 199904, Yandantu (= Yindirte) Gou, Yandantu Cun (village), Minzhu Xiang, Aksay Kazak Autonomous County, Gansu, China; upper Oligocene.

Diagnosis Medium-sized *Eomyodon*; cheek teeth brachydont with distinct cusps, longitudinal crest often interrupted; lower cheek teeth with posterosinusid; p4 with distinct protostylid and without anteroconid or anterolophid; m1/2 with free anterolophid, long mesolophid, lingually open synclinids, well developed synclinid IV, and short sinusid; M1/2 with posterior crest of paracone, long and straight mesoloph, entoloph located nearly longitudinal mid-line, long and closed syncline Ⅱ, and long sinus.

Etymology Danghe River valley is the area where the fossils were collected.

Description As the specimens are isolated teeth and only one m1 or m2 and one M1 or M2 have been collected, it is impossible to identify them with certainty as m1 or m2 and M1 or M2 at present. They are described as m1/2(= m1 or m2) or M1/2 (= M1 or M2) respectively here. The cheek teeth are brachydont with distinct main cusps and lower lophs.

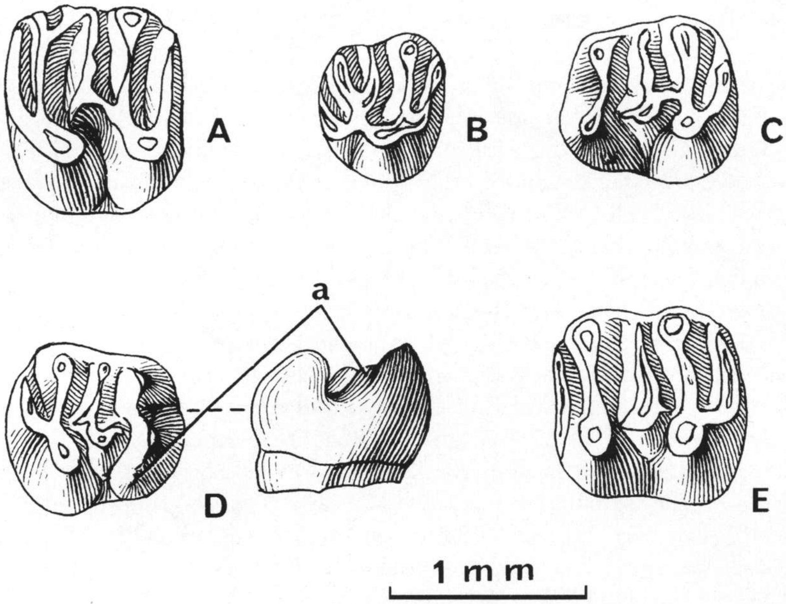


Fig.1 Cheek teeth of *Eomyodon dangheensis* sp. nov.
A. occlusal view of left M1/2 (V 13103.4); B. occlusal view of right M3 (V 13103.5); C. occlusal view of left p4 (V 13103.2); D. occlusal view and buccal view of right p4 (V 13103.3), showing the protostylid (a); E. occlusal view of m1/2 (V 13103.1, holotype)

The p4 is trapezoid in occlusal view with a narrower anterior side. The protoconid and metaconid are subequal in size. One of the particular features is that there is a distinct accessory cusp at the posterobuccal corner of the protoconid. It is called as protostylid here. The metalophid is lower at middle and slightly concave anteriorly. No distinct anteroconid or anterolophid is seen. The complete mesolophid reaches to the mesostylid. The mesoconid is prominent. The short ectolophid is slightly curved and has slender and lower anterior and posterior ends, which may be interrupted or not. The entoconid and hypoconid are subequal in size. The hypolophid is transverse or slightly oblique posterobuccally to join the hypoconid or its posterior part. Between the short posterolophid and hypoconid a more or less developed groove (called as posterosinusid here) is present. Synclinids Ⅱ, Ⅲ and Ⅳ are open lingually. The buccal ends of synclinids Ⅱ and Ⅳ extend slightly more buccally than synclinid Ⅲ does.

The m1/2 is rectangular in occlusal view, longer than wide. The distinct four main cuspids are subequal in size. The well-developed anterolophid does not connect with the metalophid and has two free ends. The nearly parallel metalophid and hypolophid extend slightly posterobuccally to join the posterior part of the protoconid and hypoconid respectively. The complete mesolophid extends from the well-developed mesoconid to the lingual margin of the tooth and does not meet the metaconid or entoconid. Synclinids Ⅱ and Ⅲ are open lingually. The poorly developed ectolophid has a slender and lower anterior end and is interrupted at the posterior end. The posterolophid reaches to the posterior wall of the entoconid and closes the synclinid Ⅳ lingually. The posterosinusid is distinct. Synclinid I is open at both buccal and lingual ends. Subequal synclinids Ⅲ and Ⅳ is shorter than

synclinid Ⅱ in length. Sinusid is communicated with synclinid Ⅲ.

The M1/2 is slightly worn out on the buccal side. The two anterior main cusps are slightly larger than the two posterior main cusps. The protoloph and metaloph are longer than the anteroloph and posteroloph and join with the anterior arms of the protocone and hypocone respectively. The meso-

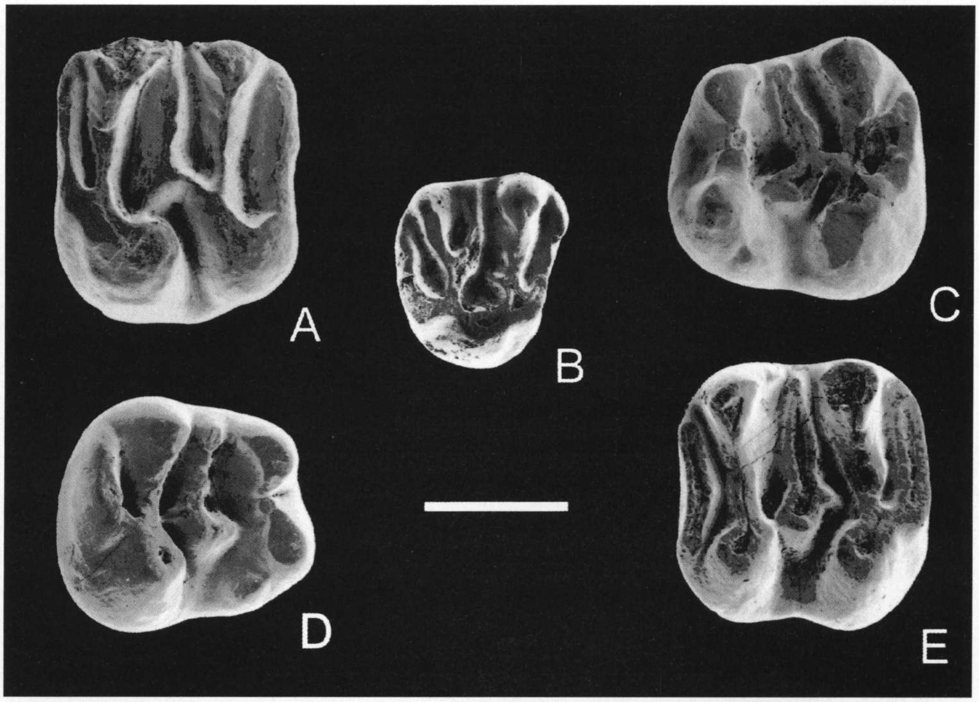


Fig.2　Occlusal view of cheek teeth of *Eomyodon dangheensis* sp. nov., scale = 0.5mm
A. left M1/2 (V 13103.4); B. right M3 (V 13103.5);
C. left p4 (V 13103.2); D. right p4 (V 13103.3); E. m1/2 (V 13103.1, holotype)

loph is straight and complete and meets the posterior crest of the paracone to close syncline Ⅱ. The lingually concave entoloph is nearly located at the longitudinal mid-line of the tooth and interrupted at the anterior end. Synclines Ⅰ, Ⅲ and Ⅳ are open buccally. Subequal synclines Ⅰ and Ⅲ have nearly same length of the sinus, and are shorter than both synclines Ⅱ and Ⅳ.

The M3 is trapezoid in occlusal view. The anterior part is similar to that of M1/2. The posterior part is reduced and the metacone and hypocone are much smaller than the paracone and protocone. The metaloph and mesoloph are connected to form a Y-shaped crest. All the buccal synclines are open buccally. Among them syncline Ⅱ is longest, syncline Ⅲ is shortest and synclines Ⅰ and Ⅳ are subequal in length. The entoloph is short and located near the lingual side. The sinus is very shallow.

Dimensions　See Table 1.

Table 1　Measurements of cheek teeth of *Eomyodon dangheensis* sp. nov.　(mm)

		L	AW	PW
M1/2	(V 13103.4)	0.9	1.05+	0.85e
M3	(V 13103.5)	0.63	0.75	0.62
p4	(V 13103.2)	0.88	0.75	0.86
p4	(V 13103.3)	0.92	0.7	0.84
m1/2	(V 13103.1, holotype)	0.96	0.95	1

Abbreviations: L, length; AW, anterior width; PW, posterior width; e, estimative.

Comparison　The specimens from the Danghe area are identical with *Eomyodon* in the basic features: the cheek teeth are brachydont with distinct cusps; the longitudinal crests are often inter-

rupted; the hypolophid joins the hypoconid or its posterior part and synclinid Ⅳ is relatively short on p4 and m1/2; the metalophid of the lower molar is backwards directed; syncline I of M1/2 relatively short. However, they are different from the known species of *Eomyodon* [*E. volkeri* Engesser, 1987; *E. pusillus* (Fahlbusch, 1969); *E. mayoi* Engesser, 1990; *E. weidmanni* Engesser, 1990; *E. staudachensis* Engesser, 1990 and *E. asiaticus* (Wang and Emry, 1990)] and represent a new species, named as *Eomyodon dangheensis* here. *E. dangheensis* differs from all the known species in having a protostylid on p4. It is slightly larger than *E. volkeri* and *E. mayoi* but smaller than *E. weidmanni*, *E. staudachensis* and *E. asiaticus* in size. In addition, it is different from *E. volkeri* in having longer synclinid Ⅱ, Ⅳ and hypolophid on lower cheek teeth; from *E. pusillus* in having longer mesolophid and hypolophid, a more developed synclinid Ⅳ and a distinct posterosinusid on lower cheek teeth, and lacking anteroconid on p4; from *E. mayoi* in being more bunodont, having a posterosinusid on lower cheek teeth, a free anterolophid, a less oblique metalophid, a longer and backwards oblique hypolophid, lingually open synclinids Ⅱ and Ⅲ, a more developed synclinid Ⅳ on m1/2, and lacking anterolophid on p4; from *E. weidmanni* in being more bunodont and having lower crown, a relatively smaller p4 without anterolophid, a free anterolophid and a longer synclinid Ⅳ on m1/2, a shorter syncline Ⅰ and a longer syncline Ⅱ on M1/2; from *E. staudachensis* in being more bunodont, having lower crown, a more buccally located ectolophid, longer hypolophid, synclinids Ⅲ and Ⅳ, a shorter sinusid and a distinct posterosinusid on lower cheek teeth, a free anterolophid on m1/2, and lacking anterolophid on p4; from *E. asiaticus* in having lower crown (see Fig.3), M1/2 having a posterior crest of paracone, a longer and straight mesoloph, a longer sinus, lower cheek teeth having a distinct posterosinusid, m1/2 having a free anterolophid and a lingually open synclinid Ⅱ.

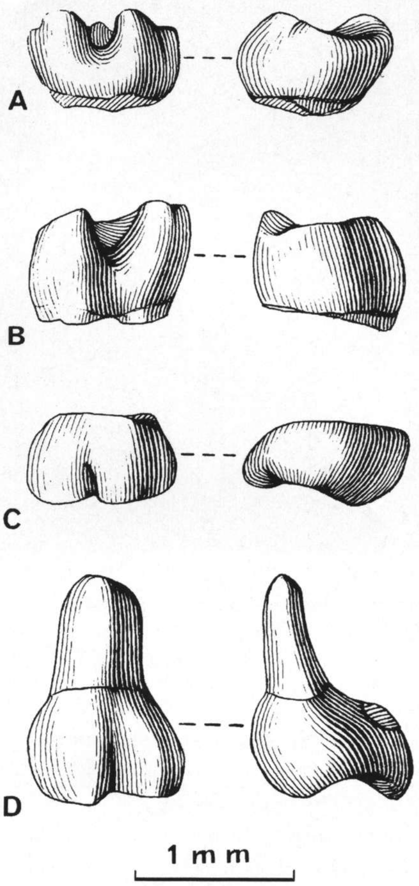


Fig.3 Comparisons of cheek teeth of *Eomyodon dangheensis* sp. nov. and *E. asiaticus*
A. left m1/2 (V 13103.1, holotype) of *E. dangheensis*: left, buccal view, right, posterior view; B. right m1/2 (V 9574, holotype) of *E. asiaticus*: left, buccal view, right, posterior view; C. left M1/2 (V 13103.4) of *E. dangheensis*: left, lingual view, right, posterior view; D. right M1/2 (V 9564, paratype) of *E. asiaticus*: left, lingual view, right, posterior view

Discussion *Eomyodon* is known to occur in Europe from late Oligocene (MP 28) through early Miocene (MN1) (*E. pusillus* is known to occur from MP 28, *E. volkeri* from MP 28 through MP30, *E. weidmanni* from MP 30, *E. mayoi* from MP 30 through MN1, *E. staudachensis* and *E.* aff. *E. mayoi* from MN1) and in late Oligocene in Asia (Engesser, 1987, 1990; Wang and Emry, 1990). If the earliest species *E. pusillus* and *E. volkeri* represent the more primitive ones and the last species *E. staudachensis* and *E.* aff. *E. mayoi* represent the more advanced ones, it seems that *Eomyodon* shows some evolutionary tendencies. In the advanced forms the cheek teeth are higher crowned and more lophodont. The longitudinal crest is more often interrupted. Synclinid Ⅳ tends to be shorter. The anterolophid is often

present and joins with protoconid on p4. The anterolophid is connected with the metalophid on lower molars. If the above assumption is tenable, *E. dangheensis* seems to be in the same evolutionary stage as *E. volkeri*, slightly more primitive than *E. asiaticus* and much more primitive than *E. staudachensis* of the early Miocene. Based on its evolutionary level, *E. dangheensis* is supposed to be of late Oligocene in age.

Reexamination of the specimens of *Pseudotheridomys asiaticus* (Wang and Emry, 1990) reveals that these specimens, except V 9575, are more similar to those of *Eomyodon* rather than *Pseudotheridomys*. The features commonly shared by *P. asiaticus* and *Eomyodon* are: the longitudinal crest is often interrupted on cheek teeth; the metalophid is often oblique posterobuccally, the accessory crest in synclinid Ⅱ is absent, synclinid Ⅳ and posterolophid are relatively short on lower molars; hypolophid is present on m3; anteroloph and syncline I are poorly developed on P4; syncline I is rather short on M1/2. It seems that the species, *asiaticus*, is to be transferred from *Pseudotheridomys* to *Eomyodon*. It is necessary to mention that the p4(V 9573) was originally described as having no mesolophid (Wang and Emry, 1990, p.373). In fact, V 9573 does have a complete mesolophid extending from ectolophid to the lingual side, but it was so heavily worn and became so low that it was not recognized at that time. V 9575 (m1/2) is still retained in its original genus as *Pseudotheridomys* sp.

The genus *Eomyodon* had only been known from Europe until 1990, when *Eomyodon* sp. was described based on a heavily worn m1/2 from Nei Mongol in China (Wang and Emry, 1990). If the specimens from the Danghe area and *Pseudotheridomys asiaticus* belong to *Eomyodon*, *Eomyodon* occurred and became diversified in late Oligocene in Asia. It seems evident that the exchange of the *Eomyodon* only took place between Asia and Europe in late Oligocene, without entering North America.

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